

The Pan-Pacific Entomologist

Vol. 54

OCTOBER 1978

No. 4

Some Larvae of Diamesinae and Podonominae, Chironomidae from the Brooks Range, Alaska, with Provisional Key

(Diptera)

Larry J. Tilley

Water Resources Division, U.S. Geological Survey, Menlo Park, CA 94025

Reconnaissance samples of benthic invertebrates from two arctic-alpine streams, the Dietrich and Atigun Rivers, Alaska were dominated by larvae of Chironomidae (Slack and others, 1977, and unpub. data, 1977). In both rivers the headwaters were dominated by the chironomid subfamily Diamesinae which was replaced in abundance by the subfamily Orthocladiinae downstream. Although chironomids are known for their abundance in arctic freshwaters (Downes, 1962, 1964, Hobbie, 1973) little taxonomic information is available for Alaska. The present report describes and provides a key for the larvae of twelve Diamesinae taxa and a single representative of the subfamily Podonominae.

The Atigun River flows northward and the Dietrich River flows southward from the Continental Divide in the Brooks Range (Fig. 1). The trans-Alaska pipeline corridor traverses both drainage basins, but the collections on which this study is based were made in August 1971 before pipeline and road construction was initiated.

Methodology

Samples were preserved in 40 percent isopropyl alcohol when collected, and were later separated in the laboratory from detritus by sugar floatation (Anderson, 1959). The introductory keys for chironomid larvae prepared by Mason (1973) and Beck (1968) were most useful since they indicated the morphological characters of greatest value in the separation of species. Other helpful keys were those of Johannsen (1937), Chernovskii (1949), Roback (1957) and Pankratova (1970, in Russian).

The chironomid larvae were first sorted into visually distinct groups. A sample from each group was prepared for microscopic

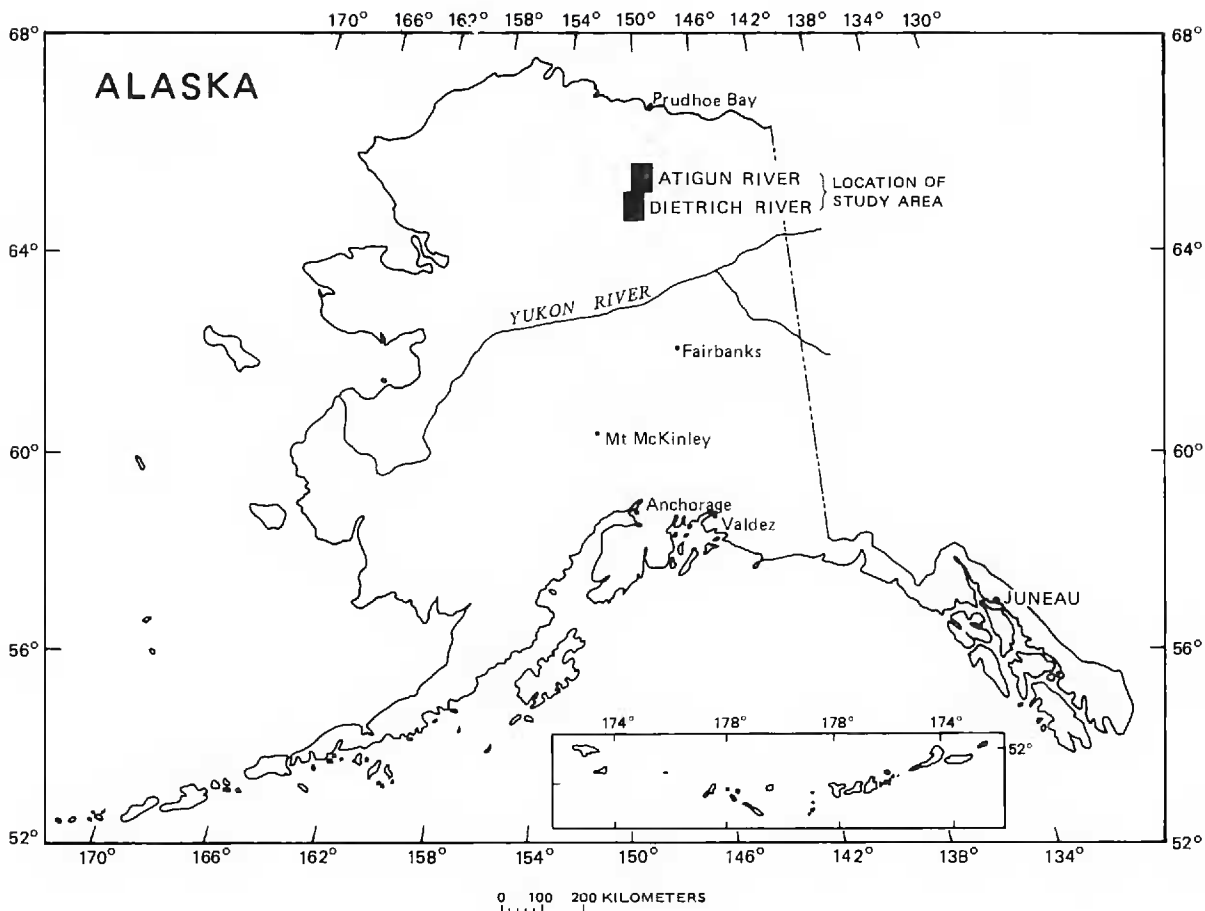


Fig. 1., Map of Alaska showing location of Dietrich and Atigun River basins.

examination by bleaching in hot 10 percent KOH (potassium hydroxide) solution, to dissolve soft body tissues. Each specimen was then placed ventral side up on a glass slide in CMC-10¹ mounting medium and pressed under a 12 mm diameter coverslip (Greeson, and others, 1977). The illustrations are tracings from Polaroid photomicrographs. The heavy backing of the Polaroid paper was carefully peeled from the prints and the insect parts traced using a light table. Measurements were made to the nearest micrometer with a calibrated Whipple disc grid in the ocular of a light compound microscope.

Observations and measurements of the following larval characteristics were used to separate taxa: 1. Antenna: length of each segment, ratio of length of first segment to its width ("ALAW"), length of first segment to that of remaining four segments ("AR"). 2. Labial plate: relative size, shape, and length of midtooth or midteeth; bifurcation of midtooth or number of midteeth; relationship of size, width, or length of first pair of lateral teeth to midtooth or midteeth, and total number of pairs of lateral teeth. 3. Mandibles: number of teeth and their relative size distribution. 4. Premandibles: number of digits, their relative size and appearance. 5. Preanal papillae: presence or absence, length versus width. 6. Preanal papillar bristles: length, number, and location.

¹Mention of trade names or commercial products does not constitute endorsement by the U.S. Geological Survey nor recommendation for use.

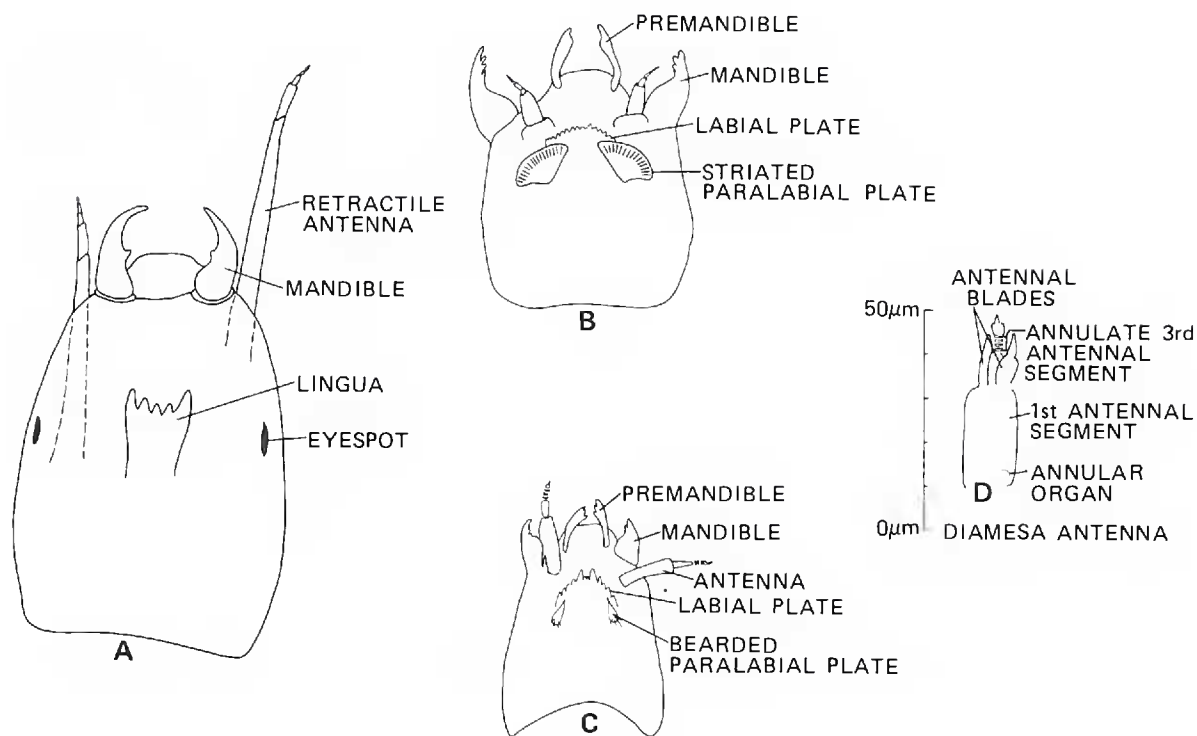


Fig. 2., Head capsule structures (ventral view) used in the identification of larval Chironomidae. (A) Tanypodinae, (B) Chironominae, (C) combined Orthoclaudiinae and Diamesinae, (D) antenna of *Diamesa latitarsis* (var. 1) to scale.

Instars were estimated using sizes of various morphological features, including body length, head capsule length, and width and length of first antennal segments. In order to show some variability of the averages, standard deviations are reported using the symbol "S.D.". Specimens with conspicuously swollen thoracic areas were considered to be fourth (last) instars.

Key to the common subfamilies of chironomid larvae and to the genera of some Diamesinae and a Podonominae from reconnaissance samples, Dietrich and Atigun Rivers, Brooks Range, Alaska, August 1971

1. Head capsule with fork-shaped lingua; antennae long, retractile, often 1/3 length of head or longer (Fig. 2A) Tanypodinae
- Head capsule without fork-shaped lingua, labial plate present (Figs. 2B and 2C); antennae not retractile 2
2. Premandible absent; preanal papillae at least 3 times longer than wide (Fig. 14) Podonominae
Trichotanypus (Kieffer) Edwards Alaska sp. I.
- Premandibles present (Figs. 2B and 2C) 3
3. Paralabial plates present, usually large, conspicuous and striated (Fig. 2B) Chironominae
- Paralabial plates usually absent, if present paralabial plates without striations, although sometimes bearded (Fig. 2C) 4

4. Third segment of antennae annulate (ringed) (Figs. 2C and 2D); premandibles usually with more than three digits . . . *Diamesinae* 6
 Third segment of antennae not annulate; premandibles usually with one or two and sometimes three digits 5
5. Generally freshwater, occasionally terrestrial
 *Orthocladiinae* (exclusive of *Clunionini*)
 Generally marine
 *Telmatogetoninae* and the *Orthocladiinae* tribe *Clunionini*
6. Conspicuous bristles on body; labial plate with five midteeth (Fig. 12) *Pseudokiefferiella* Lawrence Alaska sp. I.
 Bristles on body lacking; midteeth of labial plate otherwise 7
7. Premandibles with seven digits, beginning at apex and extending laterally down the premandible; labial plate with broad area in place of midteeth (Fig. 13)
 *Syndiamesa orientalis* Chernovskii
 Premandibles with more than one digit at apex of premandible (not as above); labial plate with midteeth usually present
 Genus *Diamesa* Meigen, 8
8. Mandible with three large apical teeth and two small proximal teeth 9
 Mandible with fewer than three large apical teeth (with two large apical and three small proximal teeth, or one large apical tooth and four small proximal teeth, or five teeth progressively smaller from apical tooth to proximal tooth) 11
9. Midtooth of labial plate distinctly bifid; first two pairs of lateral teeth of labial plate three times as long as the bifid midtooth; three digits on premandibles (Fig. 7).
 *Diamesa* Meigen Alaska sp. I
 Labial plate not as described above 10
10. Preanal papillae absent; replaced by four bristles; bristles about 100 μm in length (4th instar); up to seven digits on premandibles (Fig. 10)
 *Diamesa* Alaska sp. II (near species "B" Colorado, Saether 1970)
 Preanal papillae absent; replaced by three to five short bristles, less than 30 μm in length which may be difficult to locate; premandibles small, with six or seven digits (Fig. 8).
 *Diamesa steinbocki* Goetghebuer
11. Midtooth of labial plate with V-shaped notch (not obvious on badly worn specimens); each mandible with one large and four small teeth (Fig. 3) *Diamesa cineriella* Meigen
 Midtooth bifid or single (no V-shaped notch) 12
12. Midtooth of labial plate single 13
 Midtooth slightly bifid (Fig. 6) or bifid (Fig. 4) 14
13. Preanal papillae absent; four bristles about 150 μm in length (fourth instar) at each papilla site (Fig. 5)
 *Diamesa latitarsis* (Goetghebuer) var. 2

- Preanal papillae absent; four bristles greater than 220 μm in length (fourth instar) at each papilla site (Fig. 9) *Diamesa nivoriunda* Fitch
14. Midtooth of labial plate bifid (Fig. 4) *Diamesa latitarsis* (Goetghebuer) var. 1
Midtooth slightly bifid 15
15. Height of midtooth of labial plate less than that of adjacent lateral teeth; mandible with two large and three small teeth; preanal papillar bristles short, usually less than 100 μm long (Fig. 11) .. *Diamesa Alaska* sp. III (near species "G" Colorado, Saether 1970)
- Midtooth of labial plate highest, lateral teeth decreasing in size outwardly; midtooth slightly bifid (in worn specimens bifurcation may not show); preanal papillar bristles short, about 100 μm in length (fourth instar) (Fig. 6) *Diamesa latitarsis* (Goetghebuer) var. 3

Diamesinae

Diamesa Meigen

Larva, Pagast 1933, Meigen in Pankratova 1970.

Diamesa cineriella Meigen

(Fig. 3)

Larva, Johannsen 1905, in Pankratova 1970.

Three instars determined; body length of largest instar (fourth) 6.5-10.5 mm (average 7.8 mm, $n = 12$, S.D. = 1.80 mm); of intermediate instar (third) 2.4-4.0 mm (average 3.1 mm, $n = 16$, S.D. = 0.51 mm); and of smallest instar (second) 1.5-2.9 mm (average 2.2 mm, $n = 3$, S.D. = 0.70 mm). Head capsule of largest instar average 0.56 mm long and 0.40 mm wide ($n = 7$, S.D. = 0.73 and 0.051 mm); of intermediate instar, 0.36 mm long and 0.29 mm wide ($n = 4$, S.D. = 0.043 and 0.025 mm); and of smallest instar 0.20 mm long and 0.15 mm wide ($n = 1$). Body color of preserved specimens white during the first few weeks of storage, after storage with leaf and other detritus, brown. Head capsules dark amber or dark brown, opaque or translucent.

Antennae of largest instar (fourth) (Fig. 3A). Distance from base of antennae to annular organ 3-4 μm ; antennal blades not illustrated. Length of antennal segments of largest instar (fourth) 52: 18: 10: 3: 3 μm ($n = 12$: 12: 12: 12: 10, S.D. = 2.47: 1.96: 1.83: 1.08: 0.57 μm); width of first segment 25 μm ($n = 12$, S.D. = 1.14 μm); AR = 1.90, S.D. = 0.261; ALAW = 1.56, S.D. = 0.196. Length of antennal segments of intermediate instar (third) 24: 13: 7: 2.5: 4 μm ($n = 16$: 14: 14: 14: 1: 4, S.D. = 2.77: 3.0: 0.91: 0.51: 0.61 μm); width of first segment 15 μm ($n = 16$, S.D. = 1.40 μm); AR = 1.57, S.D. = 0.212, ALAW = 0.91, S.D. = 0.129. Length of antennal segments of smallest instar (second) 13: 12: 5: 2: 3 μm ($n = 2$); width of first segment 11 μm ($n = 2$); AR = 0.59; ALAW = 1.2.

Labial plate (Fig. 3B) with midtooth about twice as wide as the first pair of laterals. The midtooth with conspicuous V-shaped notch in middle (not so evident in specimens with badly worn mouth parts). Nine lateral teeth to each side of midtooth of labial plate, making a total of 19 teeth. Usually, last lateral tooth poorly developed in smaller instars.

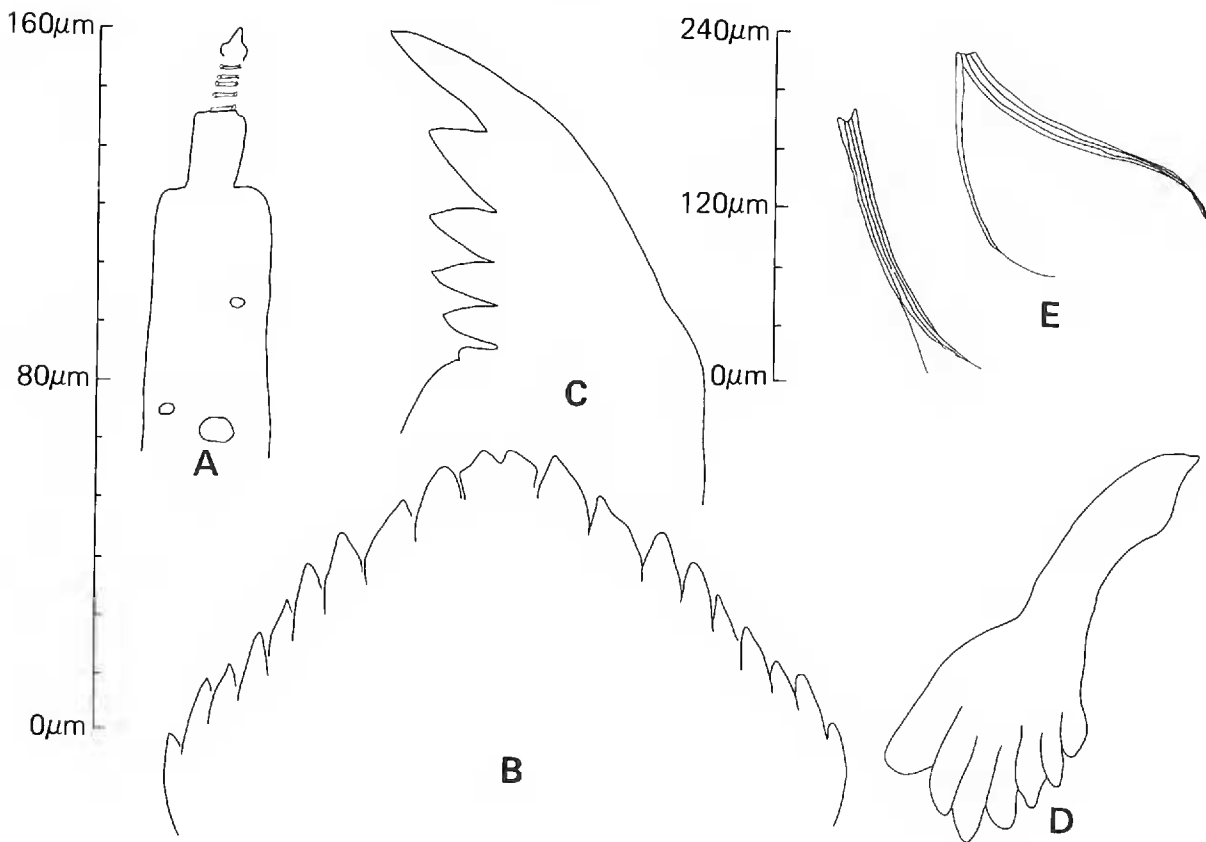


Fig. 3., *Diamesa cineriella* Meigen. (A) antenna, (B) labial plate, (C) left mandible, (D) left premandible, (E) preanal papillar bristles.

Mandibles (Fig. 3C) with five teeth, apical tooth largest and remaining four teeth subequal in size (specimens with badly worn mouth parts all five teeth may be equal). Pre-mandibles (Fig. 3D) with seven digits, most apical tooth largest and the most proximal tooth smallest (not usually present on smaller instars).

Prenal papillae absent, or nearly so. Prenal papillae replaced by four bristles (Fig. 3E); 236 μm long ($n = 10$, S.D. 19.2 μm) on the largest instar (fourth); 144 μm long ($n = 15$, S.D. = 16.3 μm) on intermediate instar (third); and 90 μm long ($n = 2$) on the smallest instar (second).

Microscope slides were prepared for 180 individual specimens. Detailed measurements were made on 32 specimens. A total of 550 specimens of *D. cineriella* was estimated from 36 samples collected at 12 sampling sites.

Diamesa latitarsis (Goetghebuer) (var. 1) (Fig. 4).

Larva, Hubault 1933, in Pankratova 1970.

Three instars determined; body length of largest instar (fourth) 2.9-10.5 mm (average 5.0 mm, $n = 25$, S.D. = 1.22 mm); of intermediate instar (third) 2.3-6.0 mm (average 3.6 mm, $n = 17$, S.D. = 1.29 mm); and of smallest instar (second) 2.2 mm ($n = 1$). Head capsule of largest instar average 0.43 mm long and 0.31 mm wide ($n = 25$, S.D. = 0.039 and 0.031 mm); of intermediate instar 0.32 mm long and 0.24 mm wide ($n = 17$, S.D. = 0.057 and 0.037 mm); and of smallest instar no measurements.

Body color of preserved specimens dark yellow to light brown, some with banded appearance (this occurred on many specimens of several taxa where that part of an over-

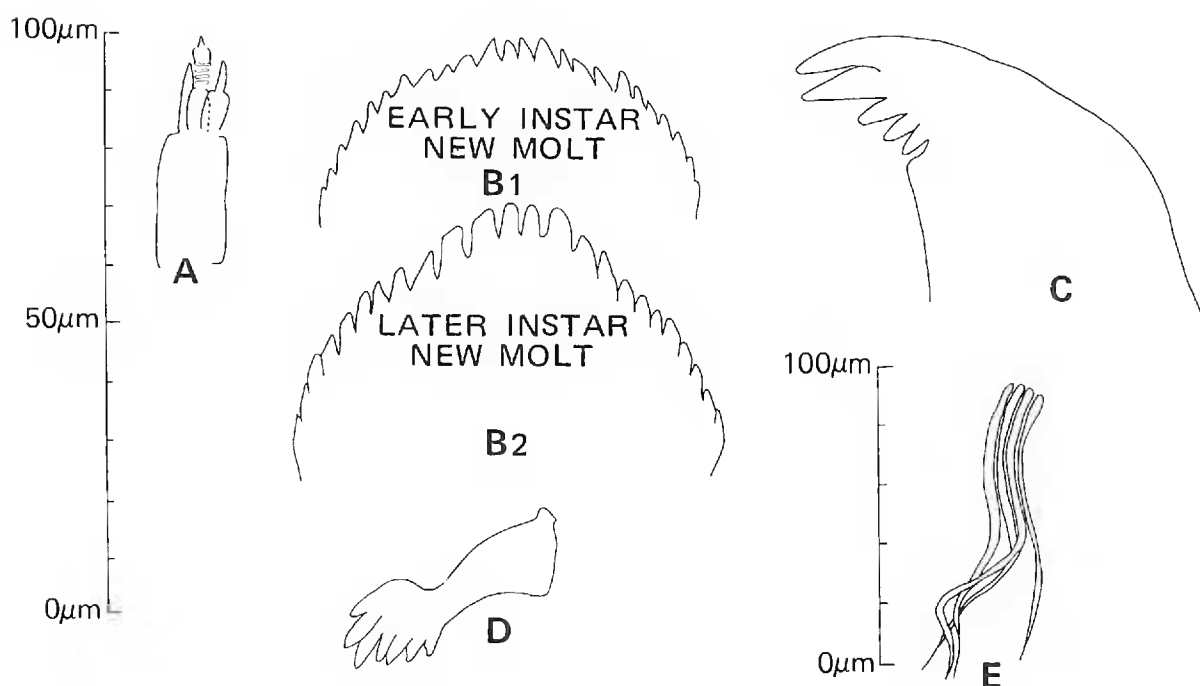


Fig 4., *Diamesa latitarsis* (Goetghebuer) (var. 1). (A) antenna, (B1) labial plate, new molt of an earlier instar, (B2) labial plate of a later instar, (C) left mandible, (D) left premandible, (E) preanal papillar bristles.

lapping abdominal sclerite was darker than the remainder of the sclerite). Head capsule color dark brown or dark amber, some translucent.

Antennae (Figs. 2D and 4A) with two blades, both attached to distal end of first antennal segment. One blade longer and narrower than the other, about one-third length of fourth segment. Second blade as wide and as long as the second antennal segment with a shorter narrower extension extending from near the end of second segment to midpart of fourth segment. Length of antennal segments of largest instar (fourth) 36: 12: 8: 3: 3 μm ($n = 46$: 42: 40: 40: 40, S.D. = 4.38: 1.53: 1.58: 0.88: 0.82 μm); width of first segment 16 μm ($n = 46$, S.D. = 2.86 μm); AR = 1.32, S.D. = 0.198; ALAW = 2.19, S.D. = 0.41. Length of antennal segments of intermediate instar (third) 23: 11: 7: 3: 3 μm ($n = 17$: 14: 11: 11: 11, S.D. = 4.1: 1.62: 1.18: 1.0: 0.67 μm); width of first segment 13 μm ($n = 17$, S.D. = 2.37 μm); AR = 0.88, S.D. = 0.089; ALAW = 1.82, S.D. = 0.387. Length of antennal segments of smallest instar second 12: 12: 7: 3: 3 μm ($n = 4$, S.D. = 3.56: 0.050: 0.10: 1.19: 1.35 μm); width of first segment 10 μm ($n = 4$, S.D. = 0.94 μm); AR = 0.45, S.D. = 0.091; ALAW = 1.23, S.D. = 0.263.

Labial plate (Figs. 4B1, B2) with two equal midteeth on specimens not badly worn. Midteeth of older, more worn specimens with less detail. There are 11 pairs of lateral teeth on the labial plate.

Mandibles (Fig. 4C) when not badly worn, with two large apical teeth and three small proximal teeth. Teeth of badly worn specimens subequal or progressively smaller apical tooth to proximal tooth. Premandibles (Fig. 4D) with seven digits.

Preanal papillae absent. Preanal papillae replaced by four stout bristles (Fig. 4E). Length of bristles range 75-140 μm , average 105 μm long ($n = 46$, S.D. = 15.86 μm) for the largest instar (fourth); range 50-110 μm , average 86 μm long ($n = 17$, S.D. = 17.34 μm) for the intermediate instar (third); and range 65-70 μm , average 68 μm long ($n = 4$, S.D. = 2.89 μm) for the smallest instar (second).

Microscope slides were prepared for 96 individual specimens. Detailed measurements were made on 64 specimens. A total of 643 specimens of *D. latitarsis* (var. 1) was estimated for the 36 samples at 12 sampling sites.

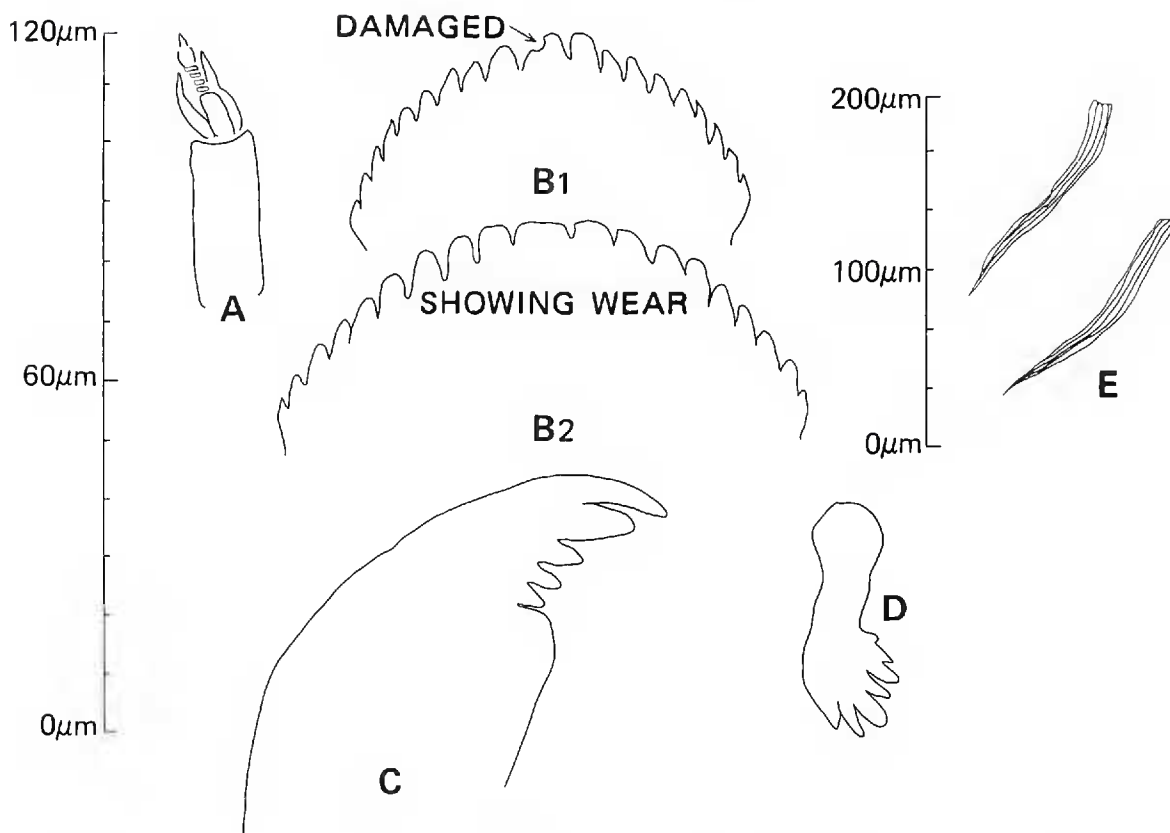


Fig. 5., *Diamesa latitarsis* (Goetghebuer) (var. 2). (A) antenna, (B1) labial plate with damaged midtooth, (B2) labial plate showing wear, (C) right mandible, (D) right premandible, (E) preanal papillar bristles.

Diamesa latitarsis (Goetghebuer) (var. 2)
(Fig. 5).

One instar only (fourth) determined for this taxon; body length 2.7-7.3 mm (average 5.0 mm, $n=31$, S.D. = 0.986 mm); head capsule 0.44 mm long and 0.32 mm wide, ($n=31$, S.D. = 0.06 and 0.038 mm). Body color of preserved specimens white to gray, or after storage with leaf and other detritus, yellow. Head capsule color red-brown, yellow-brown, or dark brown.

Antennae (Fig. 5A) with two blades similar to those of *D. latitarsis* (Goetghebuer) (var. 1) (see Fig. 4A and antennal section of same for description of the blades). Length of antennal segments 39: 13: 8: 3: 3 μm ($n=60$: 45: 44: 46: 46, S.D. = 7.89: 1.98: 1.51: 0.70: 0.71 μm); width of first antennal segment 18 μm ($n=59$, S.D. = 2.94 μm); AR = 1.50, S.D. = 0.299; ALAW = 2.19, S.D. = 0.431

Midtooth of labial plate (Figs. 5B1, B2) not bifid and slightly wider than the first pair of lateral teeth (the midtooth on most specimens observed was blunt from wear). Lateral teeth usually nine pairs, rarely ten pairs.

Mandibles (Fig. 5C), when not badly worn, with two large apical teeth and three small proximal teeth. When mandibular teeth were worn, which was normal for these specimens, the teeth became progressively smaller apical tooth to proximal tooth but tooth next to distal tooth always more robust than the others. Premandibles (Fig. 5D) with seven digits similar to *D. latitarsis* var. 1 (Fig. 4D).

Preanal papillae absent. Preanal papillae replaced by four bristles (Fig. 5E). Bristles not as stout as in *D. latitarsis* vars. 1 and 3 but longer, 157 μm ($n=65$, S.D. = 24.5 μm).

Microscope slides were prepared for 71 individual specimens. Detailed measurements were made on 59 specimens. A total of 363 specimens of *D. latitarsis* (var. 2) was estimated for the 36 samples at 12 sampling sites.

Diamesa latitarsis (Goetghebuer) (var. 3)
(Fig. 6)

Two instars determined; body length of larger instar (fourth) 3.2-9.0 mm (average 5.8 mm, $n = 23$, S.D. = 1.39 mm); of smaller instar (third) 2.9-5.4 mm (average 4.5 mm, $n = 3$, S.D. = 1.42 mm). Head capsule of larger instar (fourth) 0.48 mm long and 0.35 mm wide ($n = 23$, S.D. = 0.043 and 0.051 mm); for smaller specimen (third) 0.43 mm long and 0.35 mm wide ($n = 2$). Body color of preserved specimens variable, ranging from white, to banded and gray and as storage time increased, to dark gray or yellow; some specimens green. Head capsules amber to orange brown or dark brown.

First antennal segment (Fig. 6A) longest of the 3 *D. latitarsis* varieties. Length of antennal segment of larger instar (fourth) 58: 13: 9: 3: 3 μm ($n = 53$: 51: 50: 50: 50, S.D. = 6.71: 2.66: 1.76: 0.65: 0.69 μm); width of first segment 22 μm ($n = 55$, S.D. = 2.85 μm); AR = 2.00, S.D. = 0.325; ALAW = 2.73, S.D. = 0.319. Length of antennal segments of smaller instar (third) 30: 11: 7: 3: 2 μm ($n = 5$: 5: 4: 4: 4, S.D. = 4.88: 2.95: 1.26: 0.82: 0.50 μm); width of first segment 14 μm ; ($n = 5$, S.D. = 0.837 μm); AR = 1.29, S.D. = 0.276; ALAW = 2.22, S.D. = 0.430.

Labial plate (Fig. 6B) usually with midtooth slightly bifid. Many specimens were worn and bifurcation was not recognizable. Midtooth about one and one-half times wider than first pair of laterals. Ten pairs of lateral teeth present, but on some specimens last pair not easily seen.

Mandibles (Fig. 6C) with five teeth, apical three larger than proximal two but usually teeth progressively smaller apical tooth to proximal tooth. Premandibles (Fig. 6D) with seven digits and premandibles generally larger than those of *D. latitarsis* (var. 1).

Preanal papillae absent, or nearly so. Preanal papillae replaced by four unusually stout bristles (Fig. 6E); 95 μm long ($n = 65$, S.D. = 13.16 μm) on the larger instar (fourth); 85 μm long ($n = 5$, S.D. = 6.52 μm) on the smaller instar (third).

Microscope slides were prepared for 72 individual specimens. Detailed measurements were made on 25 specimens. A total of 241 specimens of *D. latitarsis* (var. 3) was estimated for the 36 samples at 12 sampling sites.

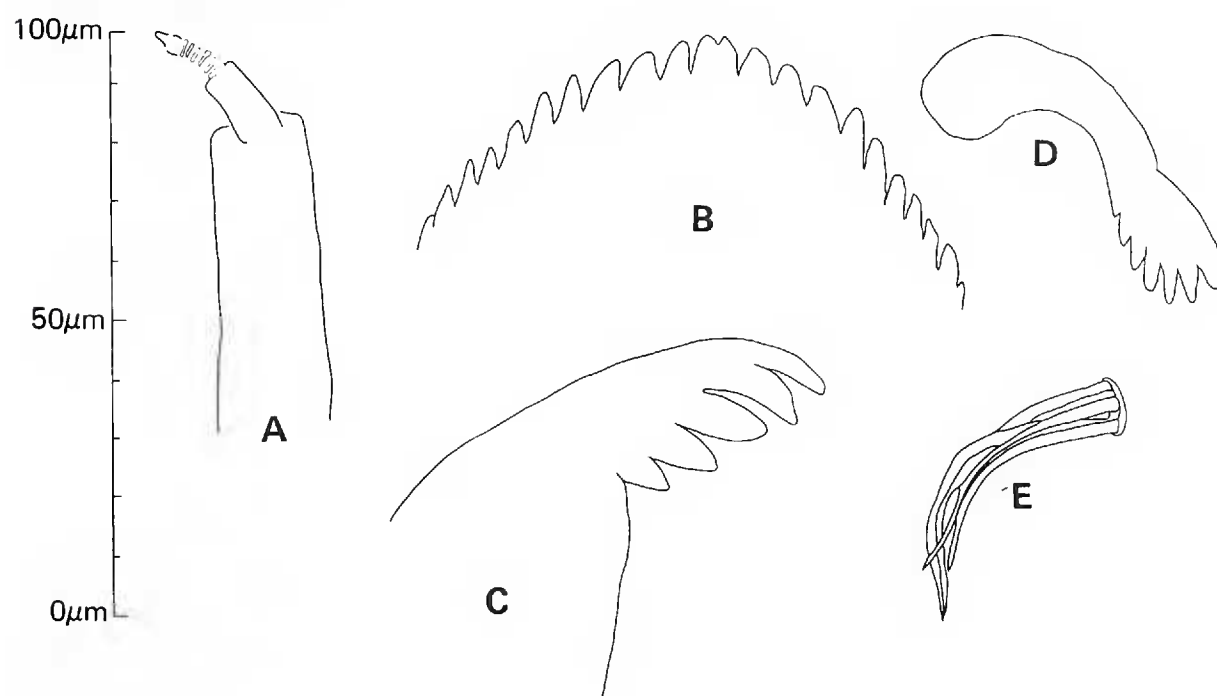


Fig. 6., *Diamesa latitarsis* (Goetghebuer) (var. 3). (A) antenna, (B) labial plate, (C) right mandible, (D) left premandible, (E) preanal papillar bristles.

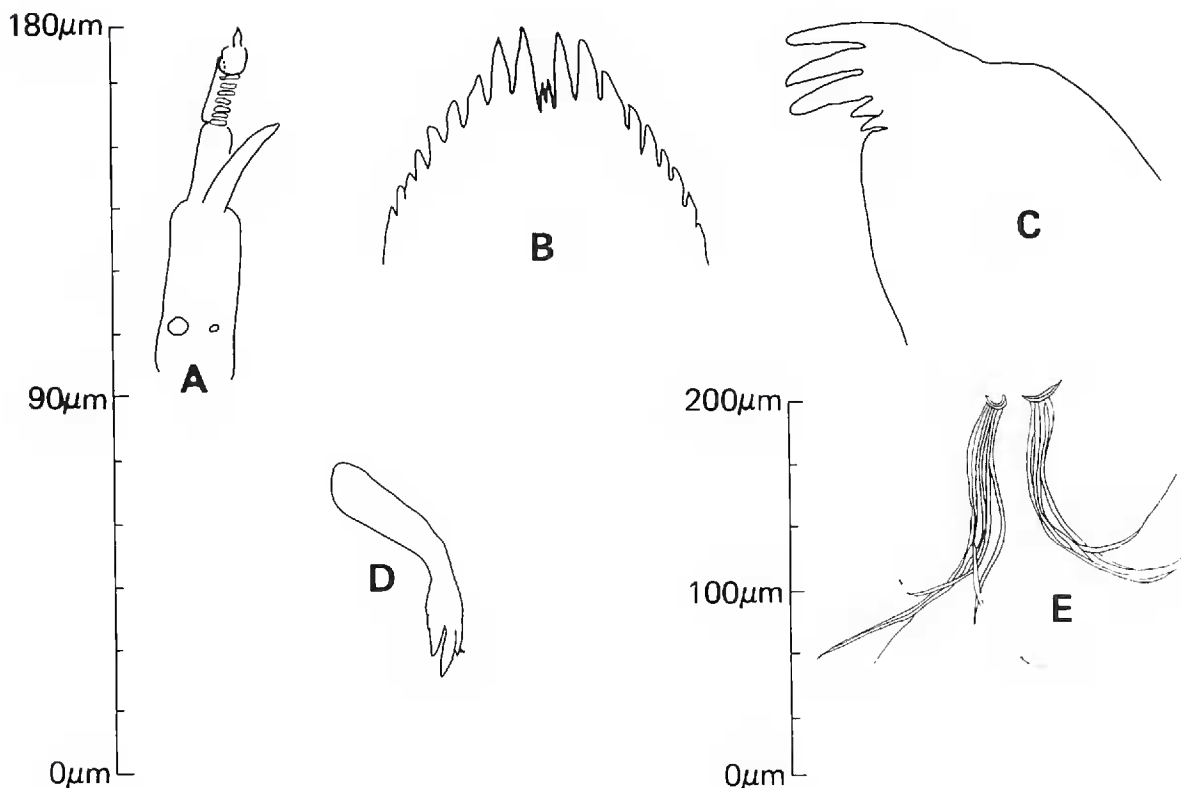


Fig. 7, *Diamesa Alaska* sp. I. (A) antenna, (B) labial plate, (C) left mandible, (D) right premandible, (E) preanal papillar bristles.

Diamesa Alaska sp. I² (Fig. 7)

Two instars determined, whether the larger instar was third or fourth could not be determined. Body length of larger instar (third or fourth) 2.8-5.1 mm (average 3.5 mm, $n = 66$, S.D. = 0.669 mm); and of smaller instar (second or third) 2.0-3.5 mm (average 2.5 mm, $n = 12$, S.D. = 0.45 mm). Head capsule of larger instar average 0.30 mm long and 0.23 mm wide ($n = 68$, S.D. = 0.041 and 0.25 mm); of smaller instar 0.21 mm long and 0.15 mm wide ($n = 11$, S.D. = 0.0337 and 0.211 mm). Body color of preserved specimens gray-white to yellow-white, some specimens with a green tinge. Head capsule dark brown to brown or tan. Dull colors result from longer storage with detritus.

Antennae of larger instar (Fig. 7A), distance from base of antenna to annular organ 6 μm ; two antennal blades, the larger blade attached at top of first segment and as long as midpart of third segment; smaller blade attached to end of second segment, and as long as midpart of fourth segment. Length of antennal segments of larger instar (third or fourth) 28: 14: 9: 3: 4 μm ($n = 36$: 32: 32: 32: 32: S.D. = 3.40: 2.75: 1.08: 0.60: 0.75 μm); width of first segment 13 μm ($n = 35$, S.D. = 2.47 μm); AR = 0.95, S.D. = 0.141; ALAW = 2.20, S.D. = 0.456. Length of antennal segments of smaller instar (second or third) 16: 12: 8: 3: 4 μm ($n = 4$, S.D. = 1.26: 0.50: 0.96: 0.50: 0.82 μm); width of first segment 9 μm ($n = 4$, S.D. = 0.95 μm); AR = 0.60, S.D. = 0.332; ALAW = 1.78, S.D. = 0.33.

Labial plate (Fig. 7B) is very distinct from other *Diamesinae* observed. Midteeth strongly bifid and about one-third length of much larger first and second pairs of lateral teeth. Nine pairs of lateral teeth present with the last pair not always observable on smaller instars.

Mandibles (Fig. 7C) with three larger apical teeth and two small proximal teeth. All five teeth on worn specimens and smaller instars nearly the same size. Premandibles (Fig. 7D) with three digits. The inner digit sometimes split along its inner margin, appearing feathered. All digits present on smaller instars.

²*Diamesa Alaska* sp. III, in Slack and others 1976, 1977, and written communication.

Preanal papillae slight (Fig. 7E); seven bristles on larger instar (Fig. 7E) 200 μm long ($n = 70$, S.D. = 27.1 μm); on smaller instar 145 μm long ($n = 7$, S.D. = 24.0 μm).

Microscope slides were prepared for 207 individual specimens. Detailed measurements were made on 70 specimens. A total of 1,179 specimens of *Diamesa Alaska* sp. I was estimated for 36 samples at 12 sampling sites.

Diamesa steinbocki Goetghebuer

(Fig. 8)

Larva, Theinemann and Mayer 1933, in Pankratova 1970

Two instars determined; body length of larger instar (fourth) 3.2-9.0 mm (average 5.5 mm, $n = 21$, S.D. = 1.28 mm); and smaller instar (third) 3.0 mm ($n = 2$). Head capsule of larger instar 0.43 mm long and 0.31 mm wide ($n = 8$, S.D. = 0.059 and 0.036 mm); of smaller instar, 0.26 mm long and 0.26 mm wide ($n = 1$). Body color of preserved specimens dark gray to yellow-brown, sometimes banded. Head capsule dark brown.

Antennae (Fig. 8A) with two antennal blades, one slender attached to first segment and about as long as end of remaining segments. The second, much smaller blade, is attached to second segment and is as long as midpart of fourth segment. The largest annular organ (Fig. 8A) was 5 μm from base of first antennal segment. Length of antennal segments of larger instar (fourth) 39: 11: 7: 3: 3 μm ($n = 21$: 16: 16: 14: 14, S.D. = 4.15: 1.80: 1.50: 0.91: 0.70 μm). (The second segment appeared to overlap the third segment in some specimens, and only part of the third segment above the second segment was measured. The average length of third segment may be greater.) Width of first segment 17 μm ($n = 21$, S.D. = 1.79 μm); AR = 1.50; S.D. = 0.215; ALAW = 2.25, S.D. = 0.195. Length of antennal segments of smaller instar (third) 23: 10: 7: 2: 2 μm ($n = 1$). Width of first segment 12 μm ($n = 1$); AR = 1.10; and ALAW = 1.92.

Labial plate (Fig. 7B) with an even number of teeth, middle 4 teeth nearly always equal in size and about as long as adjacent lateral teeth. First laterals usually slightly larger

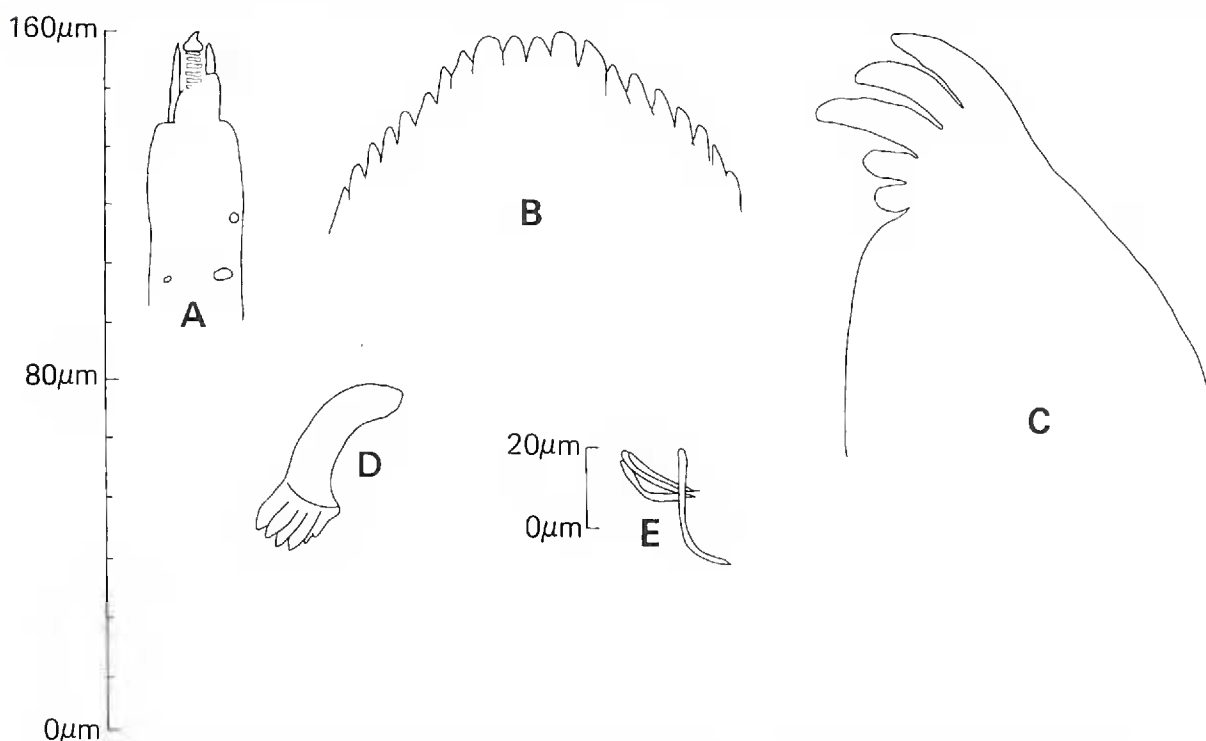


Fig. 8., *Diamesa steinbocki* Goetghebuer. (A) antenna, (B) labial plate, (C) right mandible, (D) left premandible, (E) preanal papillar bristles.

than two midteeth. Nine pairs of lateral teeth present. Midteeth on specimens with worn mouth parts with very little detail, and usually only seven to eight pairs of lateral teeth visible.

Mandibles (Fig. 8C) with five teeth, three apical teeth large and two proximal teeth much smaller. Three apical teeth of worn specimens show much more wear than the last two as in *Diamesa Alaska* sp. I (Fig. 7C). Premandibles (Fig. 8D) with six digits (sometimes seven), last two or three digits much smaller than the other four. Premandibles on *D. steinbocki* smaller than the other *Diamesa* taken in these samples except for *Diamesa Alaska* sp. I.

Preanal papillae absent; bristles at papillae sites very small and easily missed. There are three or four shorter bristles (Fig. 8E) 15 to 20 μm long and one longer bristle 20 to 30 μm long.

Microscope slides were prepared for 31 individual specimens. Detailed measurements were made on 20 specimens. A total of 144 specimens of *D. steinbocki* was estimated for 36 samples collected at 12 sampling sites.

Diamesa nivoriunda Fitch (Fig. 9)

Larva, Johannsen (1937)

Three instars determined; body length of largest instar (fourth) 4.8-8.0 mm (average 6.2 mm, $n = 18$, S.D. = 1.41 mm); of intermediate instar (third) 3.15-4.2 mm (average 3.5 mm, $n = 4$, S.D. = 0.51 mm). One specimen 1.8 mm long was considered a smaller instar (second). Head capsule of largest instar average 0.54 mm long and 0.37 mm wide ($n = 18$, S.D. = 0.068 and 0.045 mm); of intermediate instar, 0.38 mm long and 0.27 mm wide ($n = 4$, S.D. = 0.029 and 0.032 mm); and of smallest instar 0.15 mm long and 0.12 mm wide ($n = 1$).

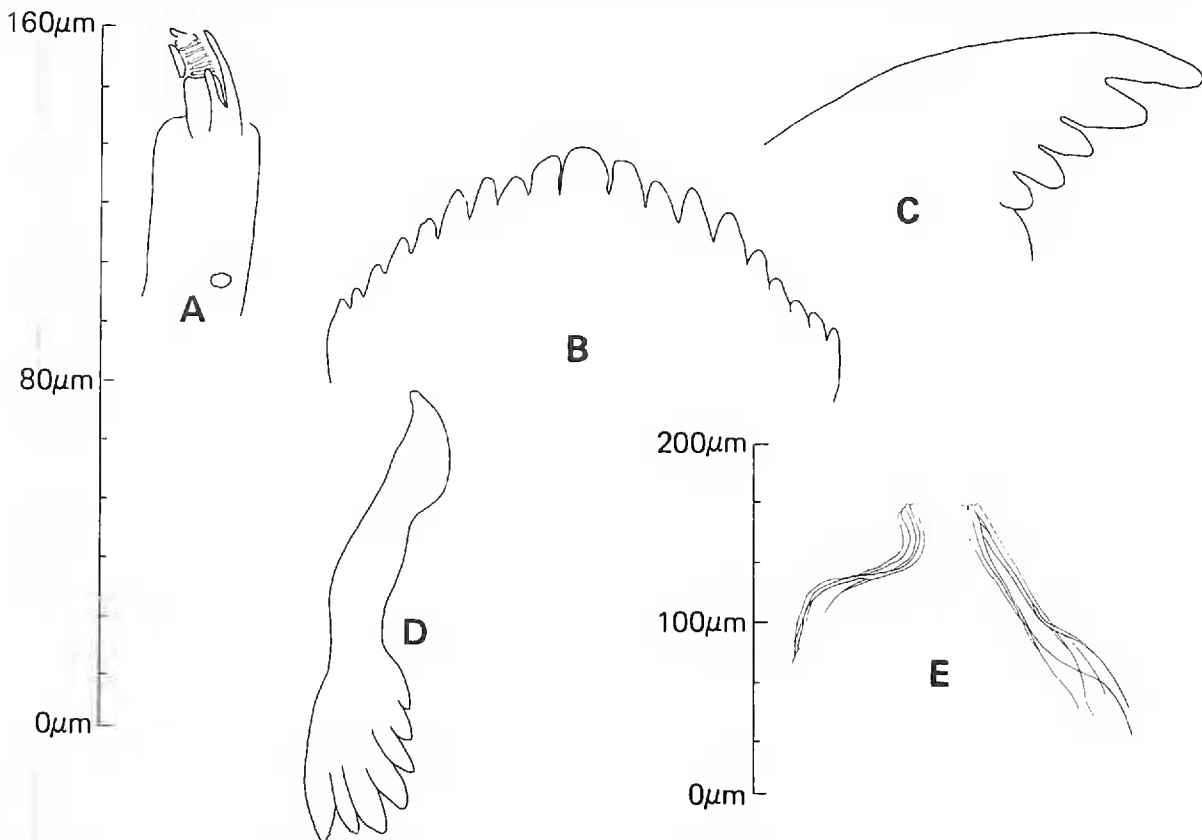


Fig. 9., *Diamesa nivoriunda* Fitch. (A) antenna, (B) labial plate, (C) right mandible, (D) right premandible, (E) papillar bristles.

Body color of preserved specimens ranged from dull white, or green-white, to gray. Head capsule dark yellow-brown to light brown.

Antennae (Fig. 9A) with two blades, one branched with longer branch as long as end of fourth segment and smaller branch as long as one-third length of third segment. Second blade short, attached to end of second segment and as long as end of fourth segment. Bottom of annular organ 6 μm from base of first antennal segment. Length of antennal segments of largest instar (fourth) 48: 15: 8: 3: 3 μm ($n = 69$: 62: 61: 61: 61, S.D. = 7.0: 2.69: 1.44: 0.67: 0.65 μm); and width of first segment 21 μm ($n = 69$, S.D. = 2.52 μm); AR = 1.67, S.D. = 0.192; ALAW = 2.32, S.D. = 0.383. Length of antennal segments of intermediate instar (third) 23: 14: 7: 2: 4 μm ($n = 4$, S.D. = 2.22: 1.5: 0.5: 0.5: 0.82 μm); width of first segment 15 μm ($n = 4$, S.D. = 0.50 μm); AR = 0.84, S.D. = 0.051; ALAW = 1.52, S.D. = 0.130. The single small specimen had damaged antennae thus no measurements possible.

Labial plate (Fig. 9B) with single midtooth only slightly larger than first laterals; midtooth rarely slightly divided. Nine pairs of lateral teeth.

Mandibles (Fig. 9C) very similar to those of *D. cineriella* with first, most apical tooth largest and remaining four proximal teeth progressively smaller. (However, in *D. nivoriunda* the second tooth appears somewhat wider and larger than on *D. cineriella* mandibles.) Premandibles (Fig. 9D) with seven digits similar to those of *D. cineriella* (Fig. 3D) but generally more slender.

Preanal papillae absent. Preanal papillae replaced by four bristles (Fig. 9E) 230 μm long ($n = 68$, S.D. = 32.4 μm) on the largest instar (fourth); bristles 160 μm long ($n = 4$, S.D. = 15.48 μm) on intermediate instar (third). *D. nivoriunda* bristles weaker, not as wide or as stiff as other bristles, such as those of *D. cineriella*.

Microscope slides were prepared for 98 individual specimens. Detailed measurements were made on 68 specimens. A total of 315 *D. nivoriunda* was estimated for the 36 samples collected at 12 sampling sites.

Diamesa Alaska sp. II (near sp. B. Colorado; Saether, 1970), (Fig. 10)

Two instars determined; body length of largest instar (fourth) 4.2-7.0 mm (average 5.3 mm, $n = 9$, S.D. = 0.87 mm); and of smaller instar (third) 2.6-3.5 (average 3.2 mm, $n = 3$, S.D. = 0.520 mm). Head capsule of largest instar 0.43 mm long and 0.30 mm wide ($n = 9$, S.D. = 0.5 and 0.56 mm); and of smaller instar 0.34 mm long and 0.23 mm wide ($n = 3$, S.D. = 0.06 and 0.065 mm). Most specimens observed were old with badly worn parts. Body color of preserved larger specimens white to gray, smaller specimens were varied usually yellow-brown or yellow-green.

Antennae (Fig. 10A) distance from base of first antennal segment to bottom of annular organ 4 μm . Two antennal blades (Fig. 10A), one arising from first antennal segment, larger than the other segment, and divided, with longer division as long as midpart of fourth segment and shorter division (possibly damaged on this specimen) as long as midpart of second segment. Second blade smaller, attached to end of second segment and as long as end of fourth segment. Length of antennal segments of largest instar (fourth) 40: 12: 9: 4: 3 μm ($n = 20$: 18: 16: 16: 16, S.D. = 5.42: 1.78: 1.51: 0.91: 0.50 μm); width of first segment 18 μm ($n = 18$, S.D. = 1.95 μm); AR = 1.47, S.D. = 0.186; ALAW = 2.22, S.D. = 0.336. Length of antennal segments of next instar (third) 22: 13: 5: 3: 3 μm ($n = 2$: 1: 1: 1: 1); width of first antennal segment 14 μm ($n = 2$); AR = 0.92; ALAW = 1.59.

Labial plate (Fig. 10B) with midtooth bifid, when worn bifurcation not evident. First and second lateral teeth larger than midtooth and all about the same length. Nine pairs of lateral teeth. Labial plate and mandibles similar to those of *D. steinbocki* (Fig. 8).

Mandibles (Fig. 10C) with three large apical teeth and two small proximal teeth. When worn, all teeth appear same size. Premandibles (Fig. 10D) with seven digits. Often the last

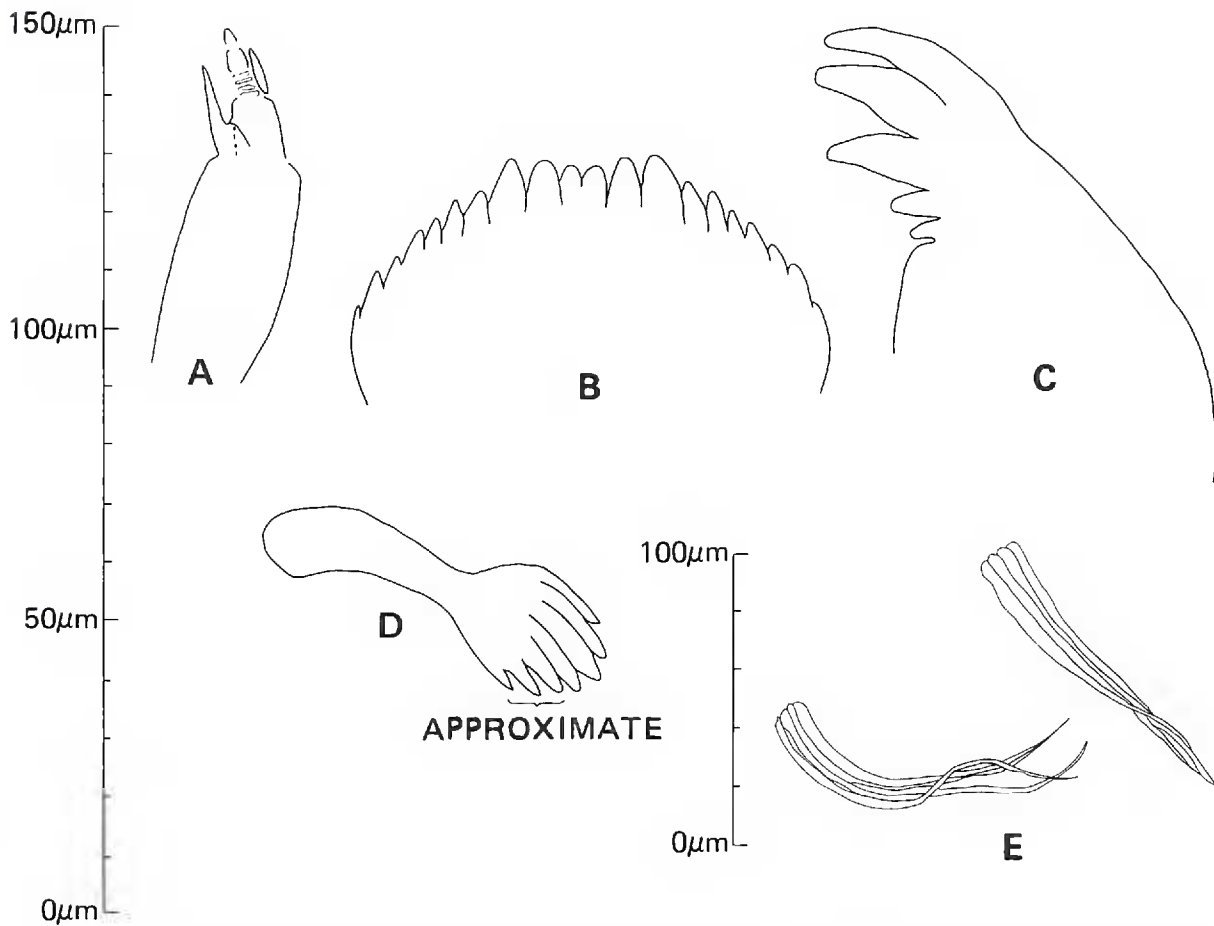


Fig. 10, *Diamesa Alaska* sp. II (near sp. B. Colorado, Saether, 1970). (A) antenna, (B) labial plate, (C) left mandible, (D) right premandible, (E) preanal papillar bristles.

digit cannot be seen as was the case for this group of specimens.

Preanal papillae absent. Preanal papillae replaced by four bristles (Fig. 10E) 100 μm long ($n = 29$, S.D. = 24.8 μm) on largest instar. On smallest instar bristles 73 μm long ($n = 3$, S.D. = 2.89 μm).

Microscope slides were prepared for 35 individual specimens. Detailed measurements were made on 22 specimens. A total of 138 specimens of *Diamesa Alaska* sp. II (near sp. B. Colorado) was estimated for 36 samples collected at 12 sampling sites.

Diamesa Alaska sp. III (near sp. G. Colorado, Saether 1970), (Fig. 11)

Only two specimens were measured. Body lengths 3.9 mm and 1.6 mm. Head capsule of larger specimen 0.35 mm long, 0.28 mm wide; smaller specimen 0.23 mm long, 0.14 mm wide. Body color of preserved specimens yellow to gold brown, darker dorsally; head capsule dark brown.

Length of antennal segments of larger specimen (Fig. 11A) (blades and annular organ not described) 19: 15: 7: 3: 4 μm long, width of first segment 11 μm ; AR=0.66; ALAW = 1.73. Antennae of the smaller specimen were missing.

Labial plate (Fig. 11B), midtooth slightly bifid, first pair of lateral teeth larger and longer than midtooth. Nine pairs of lateral teeth.

Mandibles (Fig. 11C), with two large apical teeth and three small proximal teeth. Pre-mandibles (Fig. 11D) were not clearly visible on either mount but had at least four digits, perhaps seven altogether.

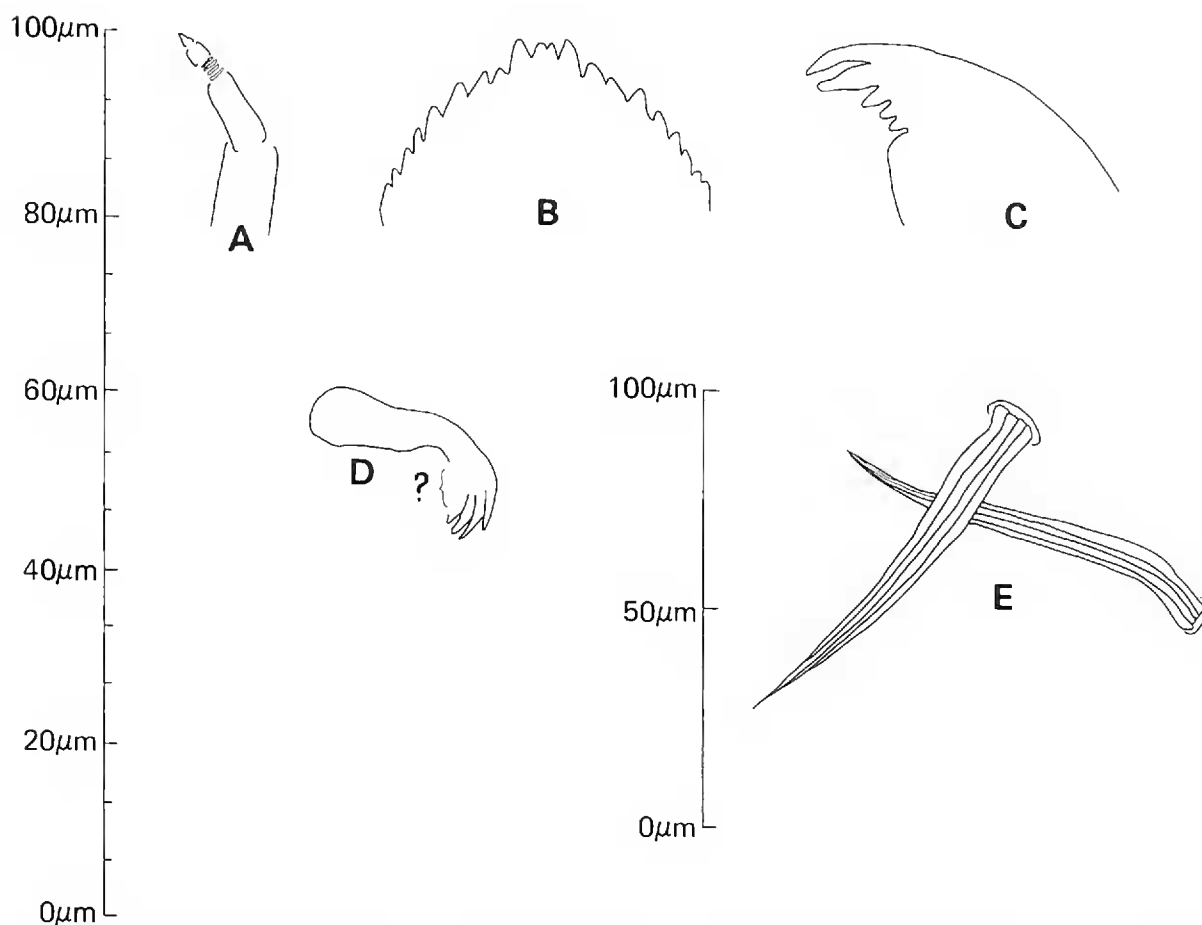


Fig. 11, *Diamesa Alaska* sp. III (near sp. G. Colorado Saether 1970). (A) antenna, (B) labial plate, (C) left mandible, (D) right premandible, (E) preanal papillar bristles.

Preanal papillae absent. Preanal papillae replaced by four stout bristles (Fig. 10E), 80 μm long.

Microscope slides were prepared for 2 individual specimens. Detailed measurements were made on 2 specimens. Only 6 specimens of *Diamesa Alaska* sp. III (near sp. G. Colorado) were estimated for 36 samples collected at 12 sampling sites.

Pseudokiefferiella Laurence (1951)
(see Brundin 1956)

Pseudokiefferiella Alaska sp. I
(Fig. 12)

Pseudokiefferiella differed greatly from the *Diamesa* specimens. For example, they had strong body bristles liberally scattered over their bodies and had large preanal papillae with extremely long preanal papillae bristles.

Only a single taxon was identified and three instars of that taxon determined. Body length of largest instar (fourth) 3.6-9.6 mm (average 6.9 mm, $n = 22$, S.D. = 1.75 mm); of intermediate instar (third) 2.2-4.2 mm (average 3.2 mm, $n = 13$, S.D. = 0.67 mm); and of smallest instar (second) 1.5-2.2 mm (average 1.8 mm, $n = 4$, S.D. = 0.29 mm). Head capsule largest instar average 0.51 mm long and 0.37 mm wide ($n = 22$, S.D. = 0.118 and 0.071 mm); of intermediate instar, 0.25 mm long and 0.18 mm wide ($n = 13$, S.D. = 0.047 and 0.039 mm) and of smallest instar 0.21 mm long and 0.14 mm wide ($n = 4$, S.D. = 0.026 and 0.016 mm).

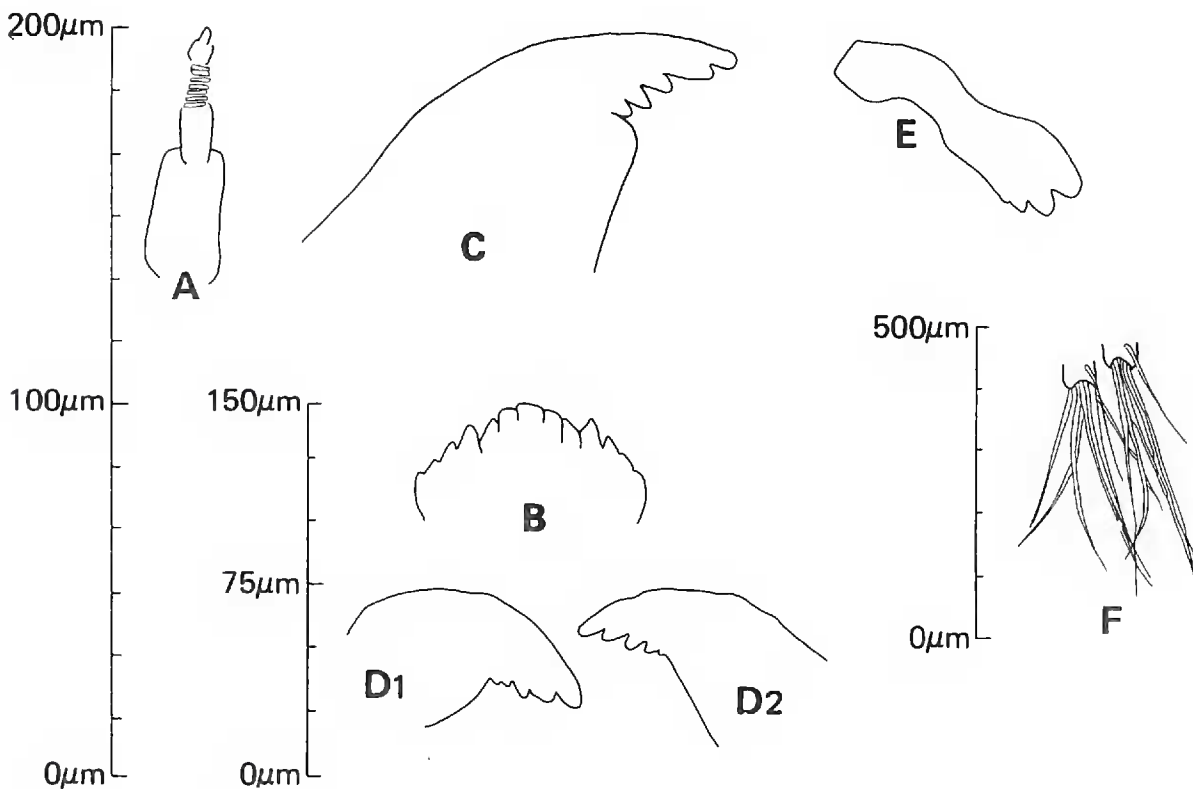


Fig. 12, *Pseudokiefferiella* Alaska sp. I. (A) antenna, (B) labial plate, (C) right mandible, (D1) right mandible, (D2) left mandible, (E) left premandible, (F) preanal papillae and papillar bristles.

Body color of preserved specimens yellow-gold, or gray. Head capsules light brown and preanal papillae bristles conspicuous.

Antennae (Fig. 12A), blades and annular organs not described. Length of antennal segments of largest instar (fourth) 48: 13: 9: 3: 3 μm long ($n=9$, S.D. = 4.92: 2.69: 2.39: 1.42: 0.93 μm); width of first antennal segment 21 μm ($n=9$, S.D. = 4.34 μm); AR=1.70, S.D. = 0.213; ALAW=2.43, S.D. = 0.710. Length of antennal segment of intermediate instar 22: 11: 8: 3: 3 μm long ($n=3$, S.D. = 1.15: 2.65: 1.0: 0.57: 0.57 μm), width of first segment 12 μm ; ($n=3$, S.D. = 2.31 μm); AR=0.97, S.D. = 0.068; ALAW=1.80, S.D. = 0.358. Length of antennal segments of smallest instar (second) 16: 10: 5: 3: 4 μm long ($n=2$); width of first segment 9 μm ($n=2$); AR=0.73; ALAW=1.78

Labial plate (Fig. 12B) with two groups of teeth, middle five teeth lighter in color and all evenly recessed into the labial plate. Four teeth on each side of the five midteeth are darker in color. Thirteen teeth on labial plate.

Mandibles (Figs. 12C, D1, D2) with five relatively small teeth becoming progressively smaller from apical teeth to proximal teeth. Premandibles (Fig. 12E) weakly digitate, some with as many as six digits, usually four or five.

Preanal papillae (Fig. 12F) for largest instar (fourth) 30 μm long and 32 μm wide ($n=9$, S.D. = 5.47 and 5.73 μm). Seven bristles attached to end of papilla and one bristle attached to side is about one-half the length of the others. Papillae bristles are stiff and stout; and seven longer bristles 310 μm long ($n=9$, S.D. = 77.1 μm). Body bristles are similar to the side papillae bristles in length and appearance. Preanal papillae of intermediate instar (third) 21 μm long, and 23 μm wide ($n=3$, S.D. = 0.58 and 1.53 μm); the seven stiff terminal bristles 240 μm long ($n=3$, S.D. = 17.56 μm); and preanal papillae of the smallest instar (second), 11 μm long and 11 μm wide ($n=2$); and the seven terminal bristles 170 μm long ($n=2$).

Microscope slides were prepared for 51 individual specimens. Detailed measurements were made on 29 specimens. A total of 153 *Pseudokiefferiella* Alaska sp. I was estimated for 36 samples collected at 12 sampling sites.

Syndiamesa Kieffer
Larva, Thienemann 1952, in Pankratova 1970.

Syndiamesa orientalis Chernovskii
(Fig. 13)

Two specimens representing different instars were found in the Atigun River. Body length of largest instar (third) 4.0 mm long; head capsule 0.21 mm long and 0.17 mm wide. Body length of smaller instar (second) 2.7 mm; head capsule 0.17 mm long and 0.14 mm wide. Body color of preserved specimens gray-yellow and head capsule light brown.

Antennal blades and annular organ (Fig. 13A) not measured. Length of antennal segments of largest instar (third) 22: 10: 7: 3: 3 μ m; width of first segment 13 μ m; AR = 0.96; and ALAW = 1.69. Length of antennal segments of smaller instar (second) 9: 7: 5: 2: 2 μ m, first segment 12 μ m wide; AR = 0.56; ALAW = 0.75. Annulations on third segment not easily seen, but the premandibles (Fig. 13D) are useful for placing specimens of this genus in the Diamesinae.

Labial plate (Fig. 13B) with wide bare area four or five times as wide as lateral teeth, with about seven pairs of lateral teeth.

Mandible (Fig. 13C) with one large apical tooth and four small proximal teeth. Second tooth appears slightly larger than remaining three smaller teeth. Premandibles (Fig. 13D) have seven digits which begin anteriorly (toward apex of premandible) and end laterally, generally becoming progressively smaller. Premandible digits fairly large relative to those of most *Diamesa*.

Preanal papillae present (Fig. 13E) but not prominent; shorter than wide; papillae on larger instar 16 μ m long and 20 μ m wide; on smaller instar 12 μ m long and 15 μ m wide. Seven terminal bristles 190 μ m long (largest instar).

Two specimens were found and measured in detail for the 36 samples taken at 12 sampling sites. Only two *Syndiamesa orientalis* were estimated for 36 samples collected at 12 sampling sites.

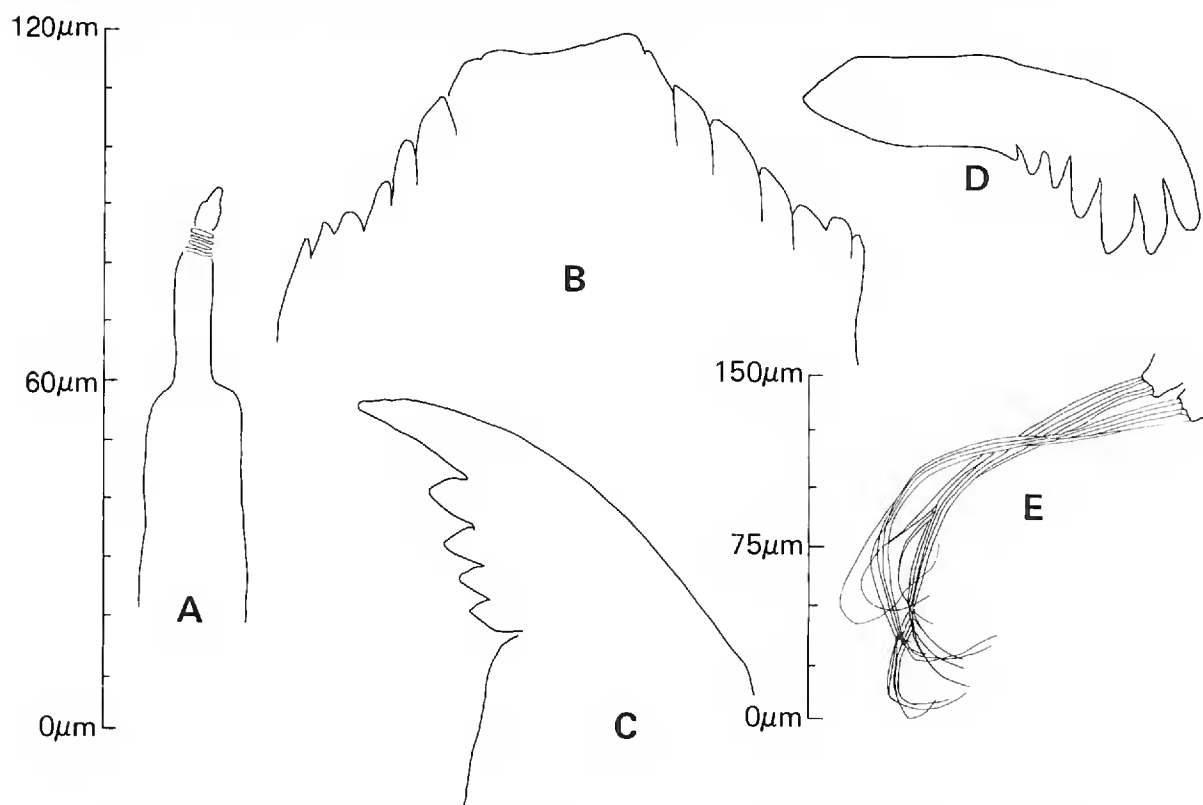


Fig. 13., *Syndiamesa orientalis* Chernovskii. (A) antenna, (B) labial plate, (C) left mandible, (D) right premandible, (E) preanal papillae and papillar bristles. Note, antenna not to scale.

Podonominae

Trichotanypus (Kieffer) Edwards, in Brundin 1966.

Larva, Brundin 1966.

Trichotanypus Alaska sp. I

(Fig. 14)

Identification corroborated by O.A. Saether, written communication, 1973.

One specimen found in the Dietrich River and six in a tributary to the Atigun River. Only one instar was determined (second or third). Body length 3.0-4.2 mm (average 3.6 mm, $n = 4$, S.D. = 0.50 mm); head capsule 0.30 mm long and 0.19 mm wide ($n = 3$, S.D. = 0.025 and 0.021 mm). Body color of preserved specimens gold-yellow and head capsule brown.

Antennae (Fig. 14A) with large, long first segments compared to Diamesinae specimens. Length of antennal segments 69: 19: 9: 5: 4 μm ($n = 2$); width of first segment 27 μm ($n = 2$); AR = 1.86; ALAW = 2.56. Third segment annulated. Antennal blades and annular organs not examined.

Labial plate (Fig. 14B) with mid area bare and extremely recessed between the lateral teeth, 12 pairs of very small (compared to Diamesinae specimens) fine-appearing lateral teeth.

Mandible (Fig. 14C) with 23 long, fine, slender teeth, tips about the same size as those in the labial plate. Premandibles absent. Preanal papillae (Fig. 14D) very conspicuous, 133 μm long and 32 μm wide ($n = 2$) with six terminal bristles 220 μm long ($n = 2$).

Microscope slides were prepared for three individual specimens. Detailed measurements were made on three specimens. Only seven *Trichotanypus* Alaska sp. I were estimated for 36 samples collected at 12 sampling sites.

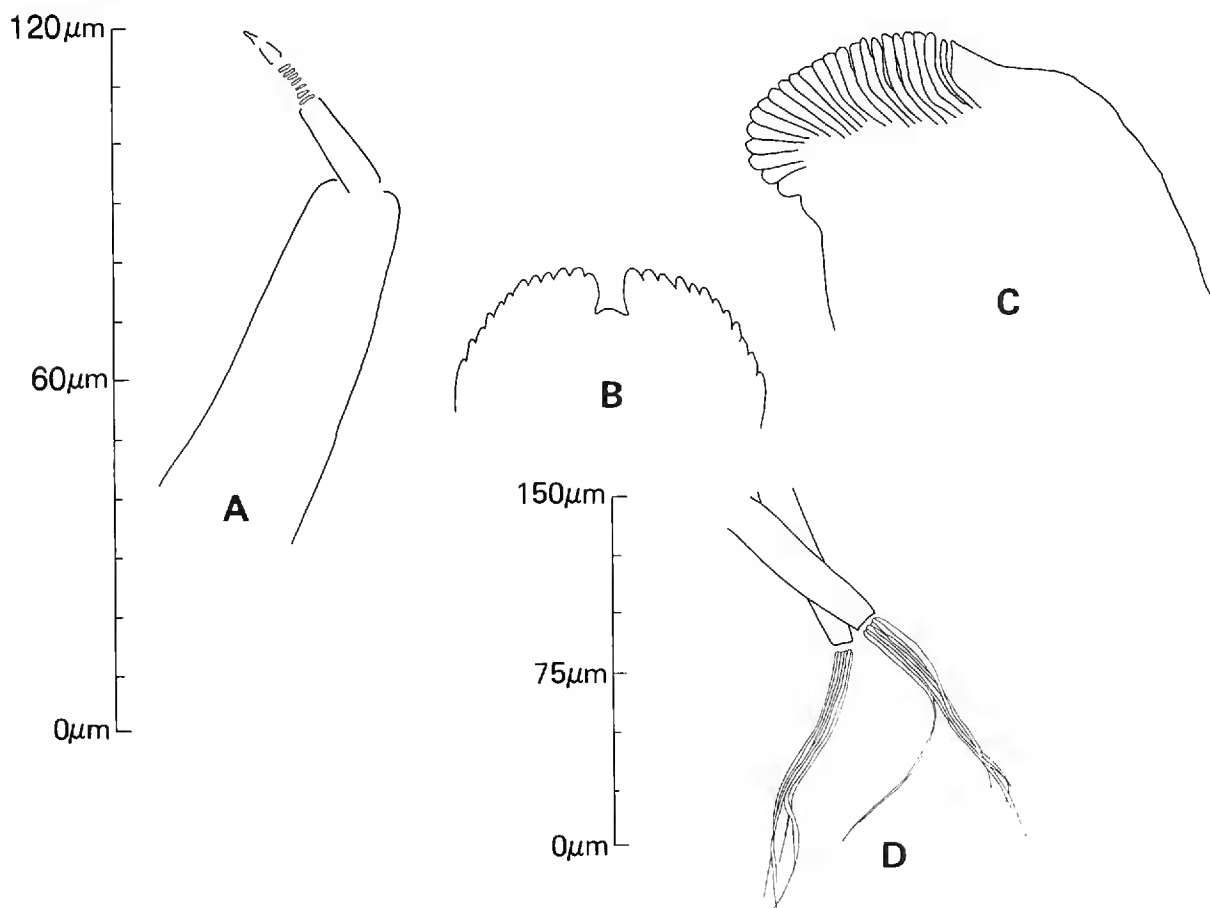


Fig. 14., Podonominae, *Trichotanypus* (Kieffer) Edwards Alaska sp. I. (A) antenna, (B) labial plate, (C) left mandible, (D) preanal papillae with papillar bristles.

Acknowledgement

Dr. Ole A. Saether of the Freshwater Institute in Winnipeg, Canada identified representative samples of each taxon. Most of the drawings were prepared from specimens examined by him. Dr. Saether placed all three *Diamesa latitarsis* varieties within the nominate species *latitarsis*; however, I have considered them separately. The specimens of *Syndiamesa orientalis* in the samples were very similar to the one figured in Pankratova (1970, Fig. 27, p. 73) and in Chernovskii (1949, Fig. 79, p. 227).

Literature Cited

- Anderson, R. O. 1959. A modified floatation technique for sorting bottom fauna samples. *Limnol. and Oceanog.*, 4: 223-225.
- Beck, W. M., Jr. 1968. Chironomidae *In* Keys to water quality indicative organisms (southeastern United States). Edited by F. K. Parrish, Fed. Water Pollut. Control Admin., v1-v22.
- Brundin, L. 1956. Zur systematik der Orthoclaadiinae (Diptera, Chironomidae). *Inst. Freshwater Res., Drottningholm: Fish. Res. Board Sweden, Rept. 37: 5-185.*
- Brundin, L. 1966. Transantarctic relationships and their significance, as evidenced by chironomid midges. With a monograph of the subfamilies Podonominae and Aphroteniinae and the Austral Heptagiae. *Kungliga Svenska Vetenskapsakademien Handlingar. Band 11(1): 1-472.*
- Chernovskii, A. A. 1949. Identification of larvae of the midge family Tendipedidae: *Izat. Akad. nauk. S.S.S.R.*, Transl. by Lees, E., (1961) (ed. K. E. Marshall), Natl. Lending Library for Sci. and Tech., Boston Spa, Yorkshire, England, 300 p.
- Downes, J. A. 1962. What is an Arctic Insect?: *Canadian Entomol.*, 94: 143-162.
- Downes, J. A. 1964. Arctic insects and their environment: *Canadian Entomol.*, 96: 279-307.
- Greeson, P. E., T. A. Ehlike, G. A. Irwin, B. W. Lium and K. V. Slack, editors, 1977. Methods for collection and analysis of aquatic biological and microbiological samples: *U.S. Geol. Surv. Techniques Water-Resources Inv.*, book 5, chap. A4. 332 p.
- Hobbie, J. E. 1973. Arctic limnology — A review, *In* Britton, M.E., ed., *Alaskan arctic tundra: Arctic Inst. North America Tech. Paper 25:127-168.*
- Hubault, E. 1927. Contributions a l'etude des invertébrés torrentico's: *Bull. Biol. France Belg.*, Suppl. 9: 162-164.
- Johannsen, O. A. 1905. Aquatic Nematoceros, Diptera. Part II. Chironomidae: *New York State Mus. Bull.* 86: 76-331.
- Johannsen, O. A. 1937. Aquatic Diptera. Part III. Chironomidae: subfamilies Tanypodinae, Diamesinae, and Orthoclaadiinae: *Mem. Cornell Univ. Agr. Exp. Sta.* 205: 1-84.
- Laurence, B. R. 1951. On two neglected type designations in the Genus *Hydrobaenus* Fries, 1830: *Entomol. Mo. Mag.* 86: 164-165.
- Mason, W. T., Jr. 1973. An introduction to the identification of chironomid larvae. *Cincinnati, Ohio, Natl. Environ. Res. Cntr.* 1-90.
- Pagast, F. 1933. Chironomidenstudien: *Stett. Entomol. Zeit.*, 94: 286-300.
- Pankratova, V. Y. 1970. [Larvae and pupae of midges of the subfamily Orthoclaadiinae of the fauna of the USSR.] *Leningrad 'Nauka'*. 1-343. [In Russian.]
- Roback, S. S. 1957. The immature Tendipedids of the Philadelphia area. *Monog. Acad. Natl. Sci., Philadelphia*, 9: 1-152.
- Saether, O. A. 1970. Chironomid and other invertebrates from North Boulder Creek, Colorado. *Univ. Colorado Stud., Ser. Biol.* 31: 57-114.
- Slack, K. V., J. W. Nauman, and L. J. Tilley. 1976. Evaluation of three collecting methods for a reconnaissance of stream benthic invertebrates. *U.S. Geol. Surv. J. Research*, 4: 491-495.

- Slack, K. V., J. W. Nauman, and L. J. Tilley. 1977. Benthic invertebrates in an arctic mountain stream, Brooks Range, Alaska. U.S. Geol. Surv. J. Research, 4: 519-527.
- Thienemann, A. 1952. Bestimmungstabellen für die larven der mit *Diamesa* nächst verwandten Chironomiden. Beitr. Entomol., 2: 244-256.
- Thienemann, A., and K. Mayer. 1933. Chironomiden-metamorphosen. VI. Die metamorphosen zweier hochalpiner Chironomiden. Zool. Anz., 103: 1-12.

Note, specimens are stored at the U.S. Geological Survey, Western Region Headquarters in Menlo Park, California.

SCIENTIFIC NOTE

Notes on the behavior of *Ametropus ammophilus* in Oregon (Ephemeroptera: Ametropodidae). — Allen and Edmunds, (1976, J. Kans. Entomol. Soc. 49 (4):625-635) revised the North American species of *Ametropus*. In that paper they described a third species, *Ametropus ammophilus*, and listed its distribution from Montana, Washington, and Oregon. Allen (1977, Pan-Pacific Entomol. 53:210) identified nymphs of *A. ammophilus* from central California, extending its known distribution. This report is on nymphal behavior and emergence of *Ametropus ammophilus* from the Wood River, Klamath Co., Oregon.

Mature nymphs of *A. ammophilus* were collected in the Wood River, 12 miles northwest of Chiloquin, on 6 June 1978. The river originates from springs. It averages 5 to 10 meters in width and meanders through open pasture for much of its course.

The nymphs appeared selective in their habitat being restricted to depositional areas where fine sand and detritus accumulated. Nymphs were abundant (est. 50/m²) on the downstream side of a sharp turn where fine clean sand, 3 to 15 cm deep, was deposited on top of a gravel substrate. They occurred in water 5 to 60 cm deep with slow to moderate currents. These mature nymphs were about 20 mm long.

The normal posture of the nymphs was on the sand bottom with the abdomen covered by a fine layer of sand and the dorsum of the thorax and head exposed. They remained in this position motionless unless disturbed, when they then swam quickly 20 to 40 cm and again settled into the sand. Their flattened body, large lateral gills, and three caudal filaments fringed with setae is an effective swimming surface. The nymphs swam easily with smooth dorsal-ventral contractions of the abdomen and with the middle and hind legs trailing to the sides.

Emergence of the subimagos occurred between 10:00 and 11:30 AM. The water and air temperature were approximately 11°C and 20°C, respectively. The sky was clear, and there was little or no wind. Mature nymphs first swam sporadically towards the shoreline before stopping in two to five cm of water. They then climbed on top of sticks or crawled closer to shore until the thorax was covered by only a thin layer of water. The exoskeleton then split along the thorax and with slight pulsations of the abdomen the subimago worked free of the exuviae. Most nymphs lost their grip of the substrate half way through ecdysis and floated on the surface during the completion of emergence. Ecdysis took 30 seconds to two minutes to complete.

Subimagoes flew from the water to nearby vegetation in 5 to 15 sec. after emergence. Three subimagoes molted to imagoes after 60 to 70 hours. The subimago stage may have been extended, however, since the specimens were kept in a cooler for the first 48 hours. Mating swarms were not observed while on the river in the morning.

We wish to thank Dr. N.H. Anderson for his critical remarks and financial support of this paper. This is technical paper No. 4922 of the Oregon Agricultural Experiment Station. — RICHARD E. HAFELE, *Entomology Department, Oregon State University, Corvallis, OR*, and DAVE HUGHES, *Astoria, OR*.